IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Hideo Nakajima

Serial No.: 10/030,732 Art Unit: 1725

Filed: January 8, 2002 Examiner: Kevin P. Kerns

For: PRODUCTION METHOD FOR POROUS METAL BODY

DECLARATION

Honorable Commissioner of Patents and Trademarks

Washington, D. C. 20231

SIR:

I, Hideo Nakajima, of 6-40, Goban-cho, Hiyoshidai, Takatsuki-shi, Osaka 569-1022 Japan, declare that:

1) I graduated from TOHOKU University, with a Doctorate in Engineering in 1977. Since 1996, I have been a Professor of the Institute of Scientific and Industrial Research in Osaka University. For more details see the attached C.V.

2) I am the inventor of the above-identified application, and am familiar with the subject matter of said application as well as the disclosures in the cited references.

3) In order to demonstrate the difference between the present

invention and the prior art, the following experiments were carried out under my direction and supervision.

Experiment

The purpose of this Experiment was to show the effects of the present method when a porous material is obtained by melting under pressurization with a mixed gas.

A porous iron material was manufactured by using the apparatus schematically shown in Fig. 8 attached to the specification. More specifically, an iron raw material (99.99% purity) was maintained for 0.1 hour at 1800°C and 5×10^{-2} Torr, and then melted for 0.5 hour at 1650°C under an atmosphere of one of the pressurizing gases in detail below with controlling total pressure at 2.5 MPa. Then, under the same pressurization conditions, the molten iron having the gas as dissolved therein was poured into a cylindrical mold (100 mm tall, 30 mm inside diameter) and solidified from the bottom to the top by means of a water cooling mechanism provided at the bottom of the mold, giving a porous iron cylinder with the structure shown in Fig. 14 (c) attached to the specification.

* Pressurizing atmosphere gas (gauge pressure)

(a) 2.5 MPa H_2

(b) 2.0 MPa H_2 + 0.5 MPa N_2

(c) 1.5 MPa H_2 + 1.0 MPa N_2

(d) 1.0 MPa H_2 + 1.5 MPa N_2

(e) 0.5 MPa H_2 + 2.0 MPa N_2

(f) 2.5 MPa N_2

The results are shown in attached Fig.28 to 30.

Fig. 28 is a graph showing the relationship between nitrogen partial pressure and nitrogen content in porous iron materials obtained under pressurization with a hydrogen-nitrogen mixed gas while maintaining the total pressure at 2.5 MPa.

Fig. 29 is a graph showing the relationship between nitrogen content and ultimate tensile strength and yield strength in porous iron materials obtained under pressurization with a hydrogen-nitrogen mixed gas while maintaining the total pressure at 2.5 MPa.

Fig. 30 shows electronically processed images showing the pore distribution state of six different porous iron materials obtained by melting at 1650℃ under pressurization with a hydrogen-nitrogen mixed gas while maintaining the controlling total

pressure at 2.5 MPa.

Consideration of the results of experiments

(1) From the results shown in Fig. 28, it is clear that nitrogen content can be increased by adjusting the nitrogen partial pressure under the pressurization of a hydrogen-nitrogen mixed gas at constant pressure conditions.

(2) From the results shown in Fig. 29, it is clear that the strength of the obtained material can be increased by adjusting the nitrogen content under pressurization with a hydrogen-nitrogen mixed gas with pressurization conditions of at constant pressure.

(3) Further from the result shown in Fig. 30 (a) to (f), it is clear that porosity and pore diameter can be kept substantially at a constant level under pressurization with a hydrogen-nitrogen mixed gas at constant pressure conditions.

These results show that the strength of a porous material can be increased with a constant porosity and pore diameter in the material by adjusting the partial pressure of a mixed gas when the material is melted under pressurization with the mixed gas under constant pressure conditions.

I, the undersigned, declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: November 10, 2004 Hideo Nakajima

Hideo Nakajima

Fig.28

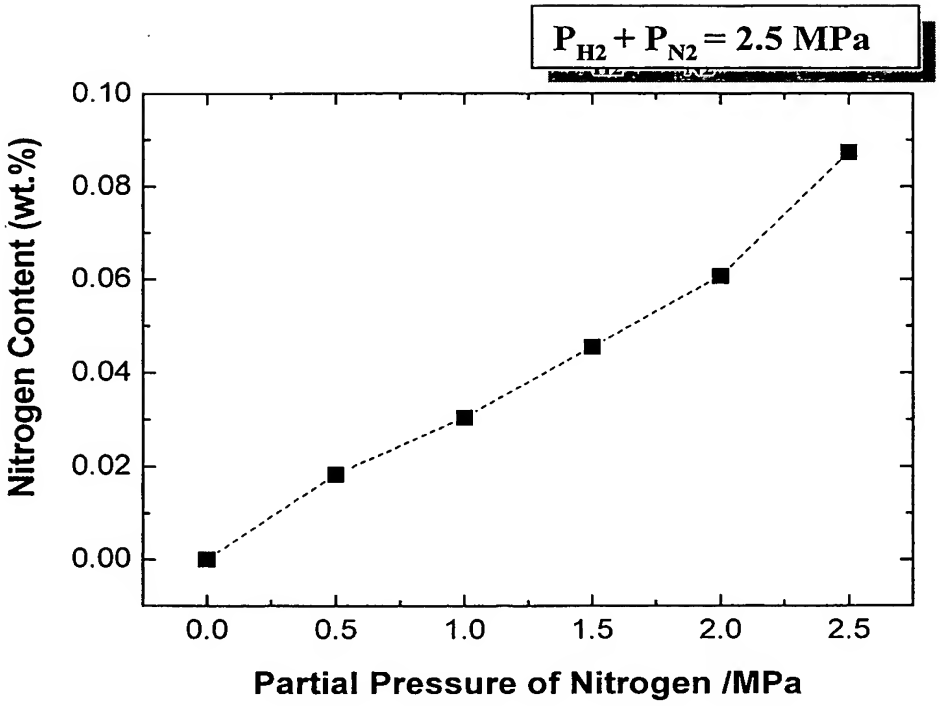


Fig.29

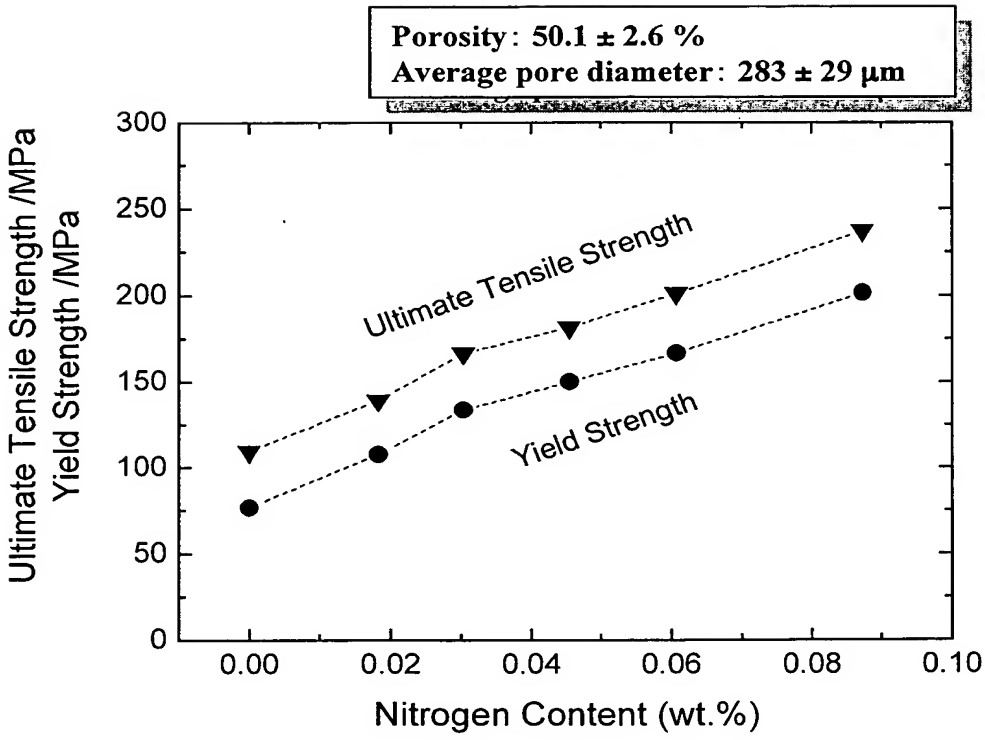


Fig.30(a)

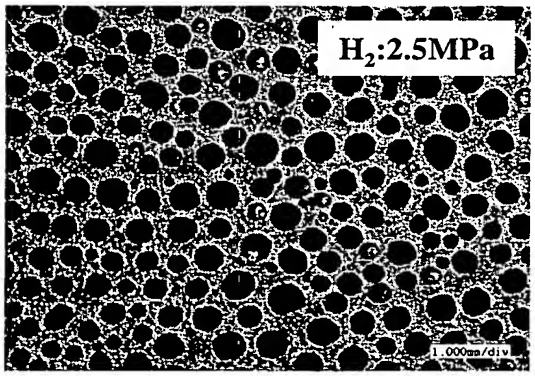


Fig.30(b)

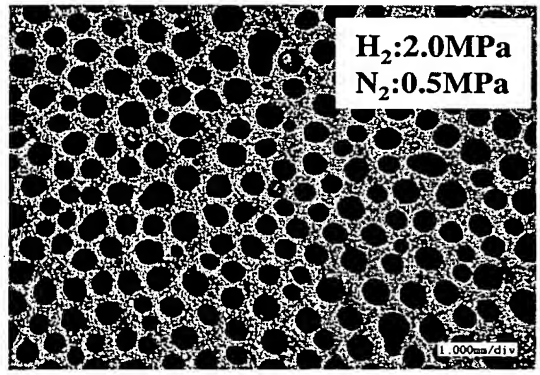


Fig.30(c)

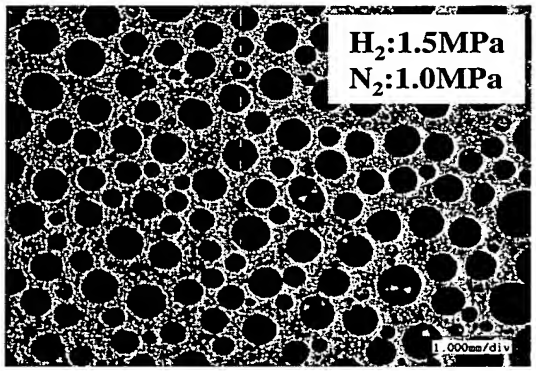


Fig.30(d)

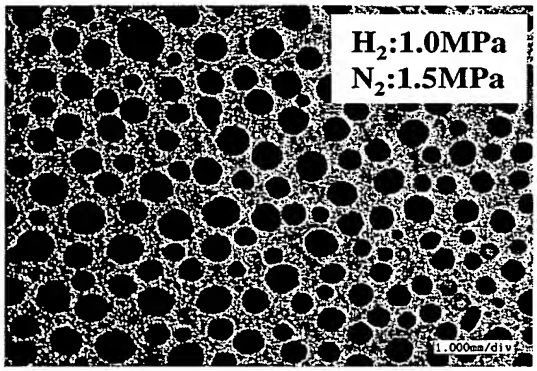


Fig.30(e)

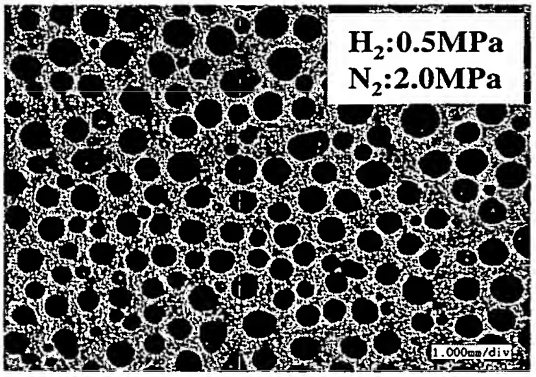
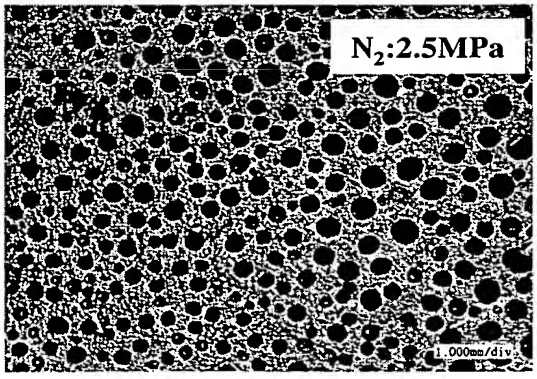


Fig.30(f)



Curriculum Vitae

Name: Hideo Nakajima

Education:

1971 B.Eng. Tohoku University
1972 M.Eng. Tohoku University
1977 D.Eng Tohoku University, Doctor of Engineering

Professional Career:

1977-1980 Postdoctoral Associate, Department of Physics, Rensselaer Polytechnic Institute,U.S.A.
1980-1989 Research Associate
Institute for Materials Research, Tohoku University
1989-1992 Associate Professor
Institute for Materials Research, Tohoku University
1992-1996 Professor, Department of Materials Science and Technology,
Iwate University
1996-Present Professor
The Institute of Scientific and Industrial Research, Osaka University

Visiting:

1985 June-October
Visiting Scientist, Chalk River Laboratories, AECL
Chalk River, Canada
1993, June-August
Visiting Scientist, Chalk River Laboratories, AECL
Chalk River, Canada
2003-Present
Chaired Professor, Gyeongsang National University, Korea

Awards:

1984 The Best Year's Papers Award
from the Japan Institute of Metals

1988 Outstanding Young Scientist Award
from the Murakami Memorial Foundation

1990 Jeffries Award
from the Japan Institute of Metals

1992 The Meritorious Honour Award
from the Japan Institute of Metals

2001 Best Year's Papers Award
from the Japan Copper and Brass Association

2001 Kansai Venture Business Grand Prix
from Kansai Venture Business Society

2004 The Tanigawa-Haris Prize
from the Japan Institute of Metals